



**Eva Crane Trust**

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## Bee products

### Honey and infant botulism: second report

In 1979, *Bee World*<sup>1</sup> reported a recommendation by some specialists in USA that honey should not be fed to infants less than a year old<sup>2, 4</sup>, because of a possible connection between infant deaths from botulism and the detected presence of spores of the bacterium *Clostridium botulinum* in a small proportion of honeys tested. The spores do not germinate in the highly acidic adult digestive tract; adult botulism is caused by food contaminated with a toxic product of the metabolism of *C. botulinum*. However, in very young infants, who have not yet developed a substantial intestinal flora and whose digestive system is likely to be less acid than that of adults, the spores may germinate and produce a population of *C. botulinum* which can form toxin within the digestive system.

The subject continued to attract attention in the USA, but to a decreasing extent, as is shown by the list of publications at the end of this article. At first honey was still the only food associated with cases of infant botulism<sup>4, 5</sup>, but in 1979 soil and dust were shown to be similarly associated<sup>3, 5</sup>: the bacterium is widely distributed in soils and dust . . . the occasional ingestion of the spores is an almost unavoidable aspect of living<sup>3</sup>. In further experiments<sup>6, 9</sup> of 90 honey samples examined showed the presence of spores, and 6 of the 9 had been fed to babies who developed botulism.

In 1980 S. S. Arnon published a review on infant botulism in the *Annual Review of Medicine*, based largely on work in the USA—the source of virtually all the honey-related discussions up to that time. Also in 1980, honeys on sale in the German Federal Republic were investigated<sup>8, 9</sup>. The first group<sup>8</sup> consisted of 210 samples on sale in Bavaria, mostly from Germany, but a few from Czechoslovakia, Hungary, Canada, Japan, Mexico, New Zealand and USA. The second group of 92<sup>9</sup> originated in Germany, and some also in Argentina, Canada, Turkey, USA and USSR. *C. botulinum* could not be detected in any sample of either group. A summary of American finding was also published in a German bee journal<sup>10</sup>. A study of micro-organisms in 56 honeys on sale in Germany<sup>11</sup> appeared in 1981: *C. botulinum* was not found, although *C. perfringens* was detected in 7 samples and *C. sphenoides* and *C. butyricum* each in a single sample.

Meanwhile work continued in the USA, and in 1980 a new approach was tried—feeding *C. botulinum* spores to colonies of bees and following their subsequent passage<sup>12</sup>. When small honeybee colonies were fed 50% sugar syrup containing  $1.6 \times 10^5$  spores, and honey was harvested 2 and 5 weeks later, results indicated that all the spores ingested by the bees had been transferred to the honey. None were found in the bees' digestive system after 2 weeks, and no spores were found elsewhere in the bees, or in the hive. The absence of spores in the bees' digestive tract 2 weeks after feeding suggests that, if bees pick up spores while foraging, they do not retain them for very long; other tests failed to find any evidence of spore germination or vegetative growth of *C. botulinum* in the honeybee digestive tract. The mode of entry of the spores into honey remains obscure.

In 1982 the question of bee involvement was made less likely by results of a survey of various American infant foods, in the Washington area<sup>13</sup>: cereals, milk, and fruit and vegetable preparations as well as honey, sugar and corn syrup. There were 90 or 100 samples of each preparation, except for corn syrup for which there were 40. *C. botulinum* spores were found in 2% of the honey samples and in 20% of the corn syrup samples. A further 961 bottles of corn syrup from different parts of the USA were therefore analysed, but only 5 (0.5%) of these contained spores. (In one of the 1979 studies<sup>6</sup> 8 infants suffering from botulism had been fed corn syrup, but no spores had been found in it.)

One 1981 investigation in the USA<sup>12</sup> included determination of *C. botulinum* spores in 80 honey samples obtained from various apiaries and honey processors. One of two tests was positive for a sample from Australia and for others from Canada, China and S. Dakota, USA; a mixture of honeys from S. Dakota, Guatemala and Mexico gave positive results in both tests. Little has been published since 1981.

Summing up, the occasional association of *C. botulinum* spores with infant foods is no longer honey-specific, and it is not confined to honeys originating in the USA. But it is so far almost entirely confined to honeys in the USA at the time of testing. Whether this is due to the comparatively large number of honeys investigated there, or to some other factor, linked for instance with honey processing methods, is not established. The route by which spores occasionally enter honey is not yet known, but if it is similar for honey and corn syrup, then it cannot involve bees.

### References

Papers listed follow on from reference 1. All are in the IBRA Library.

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